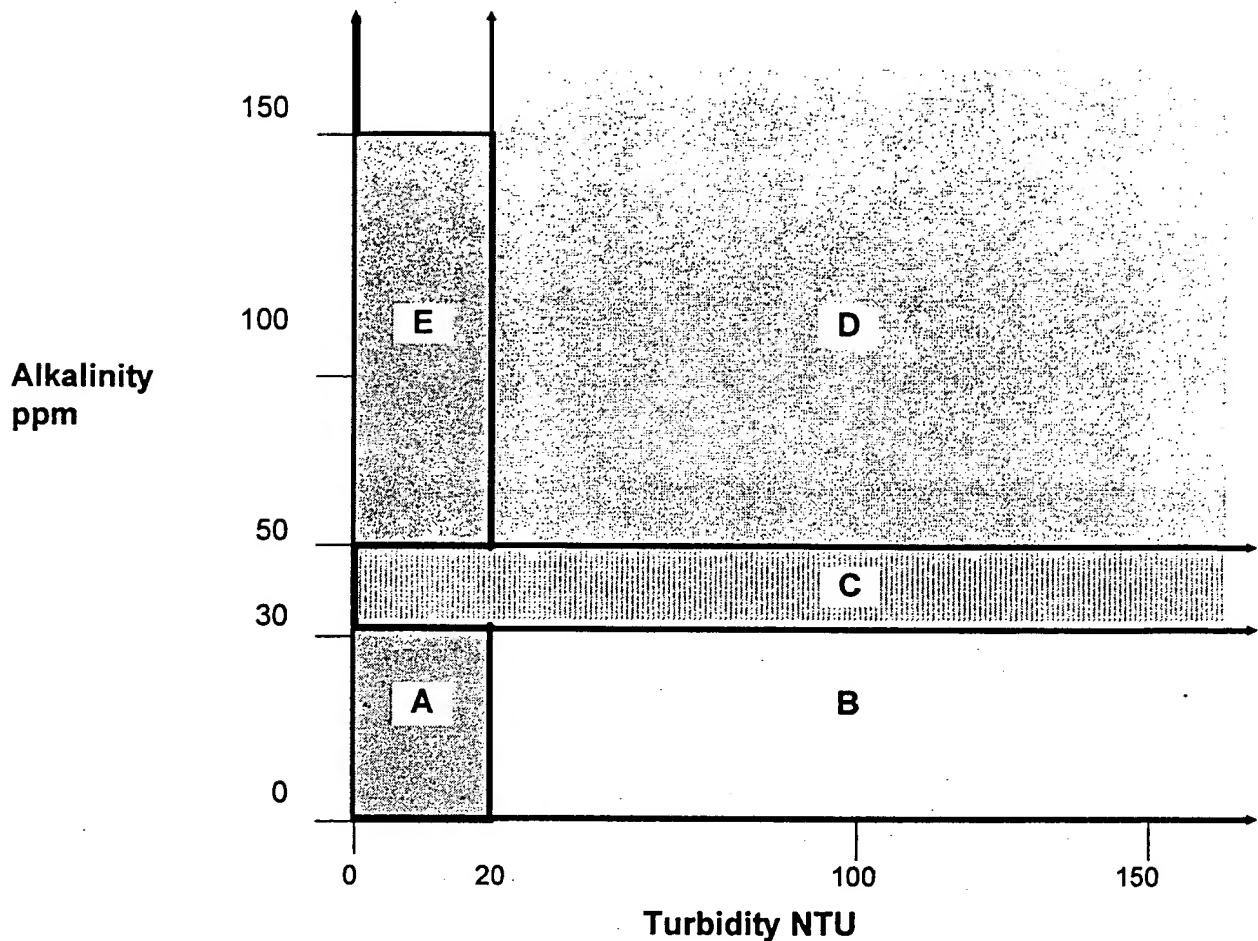


Figure 1



- A - Low alkalinity with low turbidity.
- B - Low alkalinity with moderate and high turbidity.
- C - Low alkalinity with low, moderate and high turbidity.
- D - Moderate and high alkalinity with moderate and high turbidity
- E - Moderate and high alkalinity with low turbidity.

Figure 2

Required Removal of TOC by Enhanced Coagulation and Softening			
Raw Water TOC (ppm)	Raw Water Alkalinity (ppm as CaCO ₃)		
	0-60	61-120	>120
>2.0-4.0	35.0%	25.0%	15.0%
>4.0-8.0	45.0%	35.0%	25.0%
>8.0	50.0%	40.0%	30.0%

Reference pp. 16 and 44 of 146 of NPDWR, and p. 2 of Publication of HDR Engineering, Inc., referred to as "HDR"

Test Results for Water of Low alkalinity with Low Turbidity

TEST	LOCATION	DATE	CHEM/ PPM "3"	JAR TEST MIXING (MINUTES/RPM)			RAW WATER SPECIFICATIONS			FINAL SETTLED RESULTS		
				RAPID	FLOC. SETTLE	ALK. PPM	TURB. NTU	COLOR HACH	TOC UV254	TURB. NTU	COLOR HACH	PH
1	Hot Springs, AR (Lakeside)	04/21/99	CV1787 5 ppm	3/90	15/20	15/0	1	None Visible	N/A	7.2	0.3	None Visible
2	Hot Springs, AR (Quachita)	03/31/99	CV1787 6 ppm	1/85	8/15	30/0	3	None Visible	N/A	7.2	0.7	None Visible
3	Center, TX (Mill Creek)	12/30/98	CV1703 28 ppm	1/120	10/40	30/0	16	170	N/A	6.9	1.2 ⁴	5
4	Center, TX (Pinkston)	11/12/98	CV1700 8 ppm	.75/100	15/35	20/0	6	None Visible	N/A	7.4	0.3	None Visible
5	Longview, TX (Cherokee)	03/30/99	CV1725 8 ppm	.6/80	15/30	10/0	1	101	N/A	6.8	0.3	15
6	Longview, TX (Cherokee)	01/29/99	CV1725 6 ppm	.6/80	15/30	20/0	5	111	N/A	N/A	0.5	18 ²
7	Marshall, TX	02/18/99	CV1703 30 ppm	3/50	1.5/40	10/0	4	130	0.40	5.6	0.9	11
8	Marshall, TX	02/18/99	CV1703 19 ppm	1.5/100	5/20	20/0	5	80	0.29	N/A	0.7	6
9	Marshall, TX	10/02/99	CV1703 55 ppm	3/50	1.5/40	20/0	6	230	N/A	5.9	0.6	17 ²
10	Marshall, TX	07/09/97	Alum 30 ppm CV3650	2/100	5/40	15/0	2	37	N/A	N/A	0.5	9
11	Tyler, TX	02/04/99	CV1710 7 ppm	5/100	10/60	15/0	3	None Visible	***	7.6	0.5	None Visible
12	Nacogdoches, TX	03/09/99	CV1735 14 ppm	2/100	10/30	20/0	23	260	N/A	N/A	0.7	8
13	Mt. Pleasant, TX	06/08/99	CV1740 5 ppm	1/100	5/30	20/0	3	None Visible	N/A	6.7	0.4	None Visible
14	Nacogdoches, TX	06/22/99	CV1735 7 ppm	2/100	10/30	20/0	4	56	N/A	7.0	0.2	0

1. Best Results of dosage curve. *** CV1710 obtained 47% TOC removal. Alum only obtained 19%.

2. Anthracite filters can easily remove 5 Standard Color Units.

3. Dosages are on a mass basis. Products are 40 to 50 percent active. For dosages on an active basis, conversions must be made.

4. Jar test designed to match the plant, which had VERY poor mixing. With plant modifications, operation is less than 1.0 NTU. Please refer to write up in the specification.

Test Results for Raw Water of Low Alkalinity and Moderate to high Turbidity

TEST	LOCATION	DATE	CHEM/ PPM "3"	JAR TEST MIXING (MINUTES/RPM)			RAW WATER SPECIFICATIONS				FINAL SETTLED RESULTS ¹			
				RAPID	FLOC.	SETTLE	ALK. PPM	TURB. NTU	COLOR HACH	TOC UV254	PH	TURB. NTU	COLOR HACH	TOC UV254
1	Nederland, TX	01/27/95	CV1777 66 ppm	1/120	10/30	20/0	16	73	N/A	N/A	6.4	0.8	N/A	N/A
2	Nederland, TX	01/27/95	ACH ⁴ 70 ppm	1/120	10/30	20/0	16	73	N/A	N/A	6.4	5.6 ⁴	N/A	N/A
3	Nederland, TX	01/27/95	AlCl ₃ 70 ppm	1/120	10/30	20/0	16	73	N/A	N/A	6.4	10.2 ⁴	N/A	N/A
4	Nederland, TX	12/22/97	CV1777 26 ppm	3/250	15/40	15/0	18	35	N/A	N/A	7.5	0.5	N/A	N/A
5	Nederland, TX	09/30/98	CV1777 55 ppm	3/120	5/40	10/0	22	20	225	N/A	N/A	0.5	6	N/A
6	Nederland, TX	02/23/99	CV1777 42 ppm	3/250	5/30	15/0	11	47	150	N/A	7.0	0.9	10	N/A
7	Nederland, TX	06/23/99	CV1777 40 ppm PA-AA	3/215	5/35	10/0	18	31	128	N/A	6.7	0.7	7	N/A
8	Beaumont, TX	07/07/98	CV1730 18 ppm PA-AA	2/120	10/25	Filter Paper	22	32	42	N/A	6.5	0.1 ²	2	N/A
9	Beaumont, TX	07/07/98	CV1730 90 ppm PA-AA	2/120	10/25	Filter Paper	22	32	120 Color Units Above spiked w/ Tannic Acid for capability testing.		4.3	0.1 ²	16	N/A
10	Beaumont, TX	02/11/99	CV1730 40 ppm PA-AA	2/120	10/25	Filter Paper	12	33	108	N/A	6.2	0.1 ²	5	N/A
11	Port Arthur, TX	1995	Alum 24 ppm CV3650	1/120	15/30	20/0	20	36	N/A	N/A	N/A	0.6	None Visible	N/A
12	Port Arthur, TX	06/16/99	CV1756 19 ppm	1/120	15/30	20/0	21	82	N/A	N/A	6.3	0.9	None Visible	N/A

- Best results of dosage curve.
- 40 micron filter instead of settling.
- Dosages are on a mass basis. Products are 40 to 50 percent active. For dosages on an active basis, conversions must be made.
- Single component aluminum tests for comparison. ACH was Courtney ACH @ 50% active. AlCl₃ was Courtney AlCl₃ @ 33% active.

Test Results for Raw Water of Low Alkalinity with Low to high Turbidity

Table "C"

TEST	LOCATION	DATE	CHEM/ PPM "2"	JAR TEST MIXING (MINUTES/RPM) RAPID FLOC. SETTLE				RAW WATER SPECIFICATIONS				FINAL SETTLED RESULTS ¹			
				12/18	11/16	30/0	40	38	None Visible	N/A	7.1	TURB. NTU	COLOR HACH	TOC UV254	PH
1	Kilgore, TX	06/03/99	CV1788 20 ppm	1.3/100	5/50	30/0	40	38	None Visible	N/A	7.1	0.8	None Visible	N/A	7.3
2	Shreveport, LA	10/29/98	CV1795 8 ppm	1/100	20/20	30/0	44	8	98	N/A	7.8	0.9	9	N/A	
3															
4															
5															

1. Best Results of dosage curve.

2. Dosages are on a mass basis. Products are 40 to 50 percent active. For dosages on an active basis, conversions must be made.

Test Results for Raw Water of Moderate to High Alkalinity and Moderate to high Turbidity

TEST	LOCATION	DATE	CHEM/ PPM "3"	JAR TEST MIXING (MINUTES/RPM)			RAW WATER SPECIFICATIONS				FINAL SETTLED RESULTS ¹				
				RAPID FLOC. SETTLE			ALK. PPM	TURB. NTU	COLOR HACH	TOC UV254	PH	TURB. NTU	COLOR HACH	TOC UV254	PH
1	Columbia, MO	1/18/99	CV1750 2 ppm	.5/60	15/60 5/15	30/0	≈ 150	21	None Visible	N/A	9	0.7	None Visible	N/A	9
2	Denton, TX	06/16/99	CV1740 5 ppm	2/100	10/30 5/15	10/0	120	23	None Visible	N/A	7.9	0.3	None Visible	N/A	●
3	Lewisville, TX	04/01/99	CV1790 10 ppm	3/135	2.5/70 20/20	7/0	105	27	None Visible	N/A	8.0	0.1 ²	None Visible	N/A	8.2
4	Denton, TX	04/06/99	CV1740 8 ppm	.1/185	12/40 45/30	13/0	110	23	None Visible	0.079	7.9	0.2	None Visible	0.05	8.4
5	Denton, TX	03/18/99	CV1790 6 ppm	.1/185	13/40 46/30	14/0	110	27	None Visible	0.261	7.9	0.9	None Visible	0.06	8.0
6	Ft. Worth, TX (Rolling Hills)	02/23/99	CV1735 8 ppm	2/120	17/16 17/6	20/0	81	20	None Visible	N/A	8.0	0.9	None Visible	N/A	8.2

1. Best Results of dosage curve.

2. 40 micron filter.

3. Dosages are on a mass basis. Products are 40 to 50 percent active. For dosages on an active basis, conversions must be made.

Test Results for Raw Water of Moderate to High Alkalinity with Low Turbidity

TEST	LOCATION	DATE	CHEM/ PPM "3"	JAR TEST MIXING (MINUTES/RPM) RAPID FLOC. SETTLE	ALK. PPM	TURB. NTU	COLOR HACH	TOC UV254	PH	TURB. NTU	COLOR HACH	TOC UV254	PH
1	TRA Eulless, TX	06/17/99	CV1740 8 ppm	2/100 10/30	112	4	None Visible	N/A	7.9	0.7	None Visible	N/A	7.9
2	Ft. Worth, TX (Rolling Hills)	03/02/99	CV1735 10 ppm	2/120 17/16	109	16	None Visible	N/A	7.8	0.7	None Visible	N/A	
3	Denton, TX	03/04/99	CV1790 8 ppm	1/185 13/40	109	15	None Visible	N/A	7.8	0.3	None Visible	N/A	7.9
4	DC Park Cities, TX	03/29/99	CV1740 12 ppm	1/100 15/25	105	16	None Visible	N/A	7.8	0.7	None Visible	N/A	8.0
5	TRA Eulless, TX	05/28/99	CV1740 10 ppm	2/120 7/20	120	4	None Visible	N/A	7.8	0.3	None Visible	N/A	7.8
6	Waxahachie, TX	02/16/99	CV1788 10 ppm	1/250 28/50	120	9	None Visible	N/A	7.8	0.1	None Visible	N/A	7.9
7	Columbia, MO ²	05/19/99	CV1789 3.5 ppm	1/60 15/40	~ 150	16	None Visible	N/A	9	0.5	None Visible	N/A	9
8	BRA Granbury, TX	02/10/99	CV1787 10 ppm	1/125 39/25	105	6	None Visible	N/A	N/A	0.7	None Visible	N/A	N/A

1. Best Results of dosage curve.

2. This is a lime softening facility. The raw alkalinity is 200 to 350 and the raw turbidity is 1 to 3. Testing was performed on the secondary clarifier, where, the alkalinity has already been reduced.

3. Dosages are on a mass basis. Products are 40 to 50 percent active. For dosages on an active basis, conversions must be made.

Test Results - Comparison Tests

TEST	LOCATION	DATE	CHEM/ PPM "2"	JAR TEST MIXING (MINUTES/RPM)		RAW WATER SPECIFICATIONS				FINAL SETTLED RESULTS ¹				
				RAPID FLOC.	SETTLE	ALK. PPM	TURB. NTU	HACH	TOC UV254	PH	TURB. NTU	COLOR HACH	TOC UV254	PH
1	Marshall, TX	05/14/99	CV1703 28 ppm	2.5/50 1.5/100	1.5/40 5/20	12	11	184	0.53	6.2	0.7	8	0.08	6.2
2	Marshall, TX	05/14/99	CV1703 LMW DAD 32 ppm	2.5/50 1.5/100	1.5/40 15/20	12	11	184	0.53	6.2	2.4	34	0.21	6.3
3	Marshall, TX	05/14/99	AlCl 20:1 HMW DAD 40 ppm	2.5/50 1.5/100	1.5/40 15/20	12	11	184	0.53	6.2	1.1	13	0.19	5.3
4	Marshall, TX	05/14/99	AlCl 20:1 LMW DAD 50 ppm	2.5/50 1.5/100	1.5/40 15/20	12	11	184	0.53	6.2	2.1	27	0.168	5.3
5	TRA Euless, TX	06/17/99	PAC 50% 14 ppm	2/100	10/30 5/15	112	4.0	None Visible	N/A	7.8	1.6	None Visible	N/A	7.8
6	TRA Euless, TX	06/17/99	AlCl ₃ 27 ppm	2/100	10/30 5/15	112	4.0	None Visible	N/A	7.0	0.4	None Visible	N/A	N/A
7	TRA Euless, TX	06/17/99	CV1740 10 ppm	2/100	10/30 5/15	112	4.0	None Visible	N/A	7.0	0.3	None Visible	N/A	8.0
8	Denton, TX	06/16/99	PAC 50% 14 ppm	2/100	10/30 5/15	120	23	None Visible	N/A	7.9	3.5	None Visible	N/A	N/A
9	Denton, TX	06/16/99	AlCl ₃ 24 ppm	2/100	10/30 5/15	120	23	None Visible	N/A	7.9	1.1	None Visible	N/A	N/A
10	Denton, TX	06/16/99	CV1740 6 ppm	2/100	10/30 5/15	120	23	None Visible	N/A	7.9	0.3	None Visible	N/A	N/A
11	Pt. Arthur, TX	06/16/99	PAC 50% 70 ppm	2/100	10/40 5/15	26	77	None Visible	N/A	6.4	6.0	None Visible	N/A	6.4
12	Pt. Arthur, TX	06/16/99	AlCl ₃ 70 ppm	2/100	10/40 5/15	26	77	None Visible	N/A	6.4	2.8	None Visible	N/A	5.6
13	Pt. Arthur, TX	06/16/99	CV1756 24 ppm	2/100	10/40 5/15	26	77	None Visible	N/A	6.4	0.7	None Visible	N/A	6.6

1. Best Results of dosage curve.

2. Dosages are on a mass basis. Products are 40 to 50 percent active. For dosages on an active basis, conversions must be made.

3. Aluminum Chloride is 33% active.

4. Low Molecular weight DADMAC is 20% active with a viscosity of 250 CPS which correlates to a molecular weight of about 250,000.

5. PAC is 50% active and 50% basic.

FIGURE 9

Ratios of AP-AC to Amp

Product	Sg	RM-20 AP	RM-21 AS	RM-22 M,H MW DADMAC	RM-23 LMW Epi-DMA	RM-24 M,HMW EPI-DMA	H ₂ O	AP-AS/ LMW Amp	AC-AS/ M,H,VH MW Amp
CV 1700	1.22	27/15	33/17	9/1.6	12/5.7	9/4.2	10	3	5
CV 1702	1.26	0	95/48	5/1.4	0	0	0	34	34
CV 1703	1.24	37/20	42/21	10/1.7	9/4.1	0	2	7	24
CV 1705	1.25	35/19	40/20	0	15/6.9	10/4.6	0	3	5
CV 1710	1.22	27/15	31/16	14/2.4	14/6.6	9/4.2	5	2	5
CV 1715	1.17	27/16	33/18	10/1.8	10/4.9	10/4.9	10	3	5
CV 1720	1.21	26.5/15	31.5/17	27/4.7	10/4.8	0	5	3	7
CV 1725	1.21	25/14	30/16	10/1.7	20/9.5	5/2.4	10	2	11
CV 1730	1.21	25/14	30/16	16/2.8	24/11.4	0	5	2	11
CV 1735	1.25	60/32	0	20/3.4	15/6.9	5/2.3	0	3	6
CV 1740	1.27	70/38	0	20/3.3	0	10/4.5	0	5	5
CV 1745	1.28	70/37	0	15/2.7	15/6.8	0	0	4	14
CV 1750	1.28	70/37	0	7.5/1.2	7.5/3.4	15/6.7	0	3	5
CV 1754	1.25	70/34	0	10/1.5	0	20/8.3	9	3	3
CV 1756	1.27	66/35	0	0	21/9.5	8/3.6	5	3	10
CV 1760 (old 1777)	1.23	60/33	0	40/6.8	0	0	0	5	5
CV 1770	1.23	32.5/18	37.5/19	30/5.1	0	0	0	7	7
CV 1775	1.29	75/39	0	13/2.2	12/5.4	0	0	5	18
CV 1778	1.26	60/32	0	10/1.7	30/13.7	0	0	2	19
CV 1780	1.20	50/28	0	50/8.8	0	0	0	3	3
CV 1785	1.33	90/46	0	0	7.5/3.2	2.5/1.1	0	11	42
CV 1786	1.25	50/27	0	0	30/13.8	20/9.2	0	1	3
CV 1787	1.32	85/44	0	0	0	15/6.5	0	7	7
CV 1788	1.30	80/42	0	10/1.6	10/4.4	0	0	7	26
CV 1790	1.32	85/44	0	5/0.8	0	10/4.4	0	8	8
CV 1795	1.23	45/25	0	0	32/15	13/6.1	10	1	4
CV 1798	1.34	95/48	0	5/0.8	0	0	0	60	60
CV 1901	1.31	90/46	0	6/1.8, CV5160	0	0	3	23	23
CV 1903	1.24	37/20	42/22	5/1.6, CV5180	9/4	0	4	7.5	26
CV 1995	1.20	45/25	0	5/1.7, CV5140	32/15	0	15	1.5	15
CV 1170	1.30	40/21	60/29	0	0	0	0	Infinite	Infinite
CV 1180	1.16	40/23	45/25	0	10/5	0	4	10	Infinite
CV 1190	1.30	85/44	0	0	10/4.5	0	4	10	Infinite

RM-20 is CV 1100 being a 50% active 84% basic 24% measured Al_2O_3 ACH solution having a Sg of 1.35.

RM-21 is CV 1135 being a 10% measured Al_2O_3 AlCl_3 solution having a Sg of 1.27 and an estimated 50% activity.

RM-22 is CV 3650 being a 20% active HMW DADMAC having a Sg of 1.05 and a viscosity of 2,000 +/- 1000 cps.

RM-23 is CV 3210 being a 50% active LMW Epi-DMA having a Sg of 1.15 and a viscosity of 125 +/- 50 cps.

RM-24 is CV 3250 being a 50% active HMW Epi-DMA having a Sg of 1.15 and a viscosity of 6,000 to 11,000 cps.

006260" 56952960

FIGURE 9 Continued

CV 5140 is a 40-mole % cationic Q-9 Polyacrylamide 40% Active Emulsion in Oil.

CV 5160 is a 60-mole % cationic Q-9 Polyacrylamide 40% Active Emulsion in Oil.

CV 5180 is a 80-mole % cationic Q-9 Polyacrylamide 40% Active Emulsion in Oil.

CV 5140 is a 40-mole % cationic Q-9 Polyacrylamide 40% Active Emulsion in Oil.

CV 6200P is a nonionic Polyacrylamide 40% Active Emulsion in Oil.

CV 6230P is a 30-mole % anionic Acrylic Acid Polyacrylamide 40% Active Emulsion in Oil.

005250" 56952950

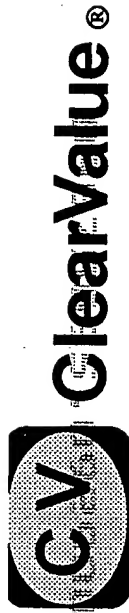


FIGURE 10

Test Results - Comparison Tests

TEST	LOCATION	DATE	CHEM/ PPM "2"	JAR TEST MIXING (MINUTES/RPM)			RAW WATER SPECIFICATIONS			FINAL SETTLED RESULTS ¹			
				3/250	5/30	15/0	PPM	NTU	HACH	UV254	TURB. COLOR	TOC	PH
1	Nederland, TX	02/23/99	ACH/Epi 20:1 40 ppm	3/250	5/30	15/0	11	47	150	N/A	7.0	9.0	7.1
2	Nederland, TX	02/23/99	ACH/DAD 20:1 45 ppm	3/250	5/30	15/0	11	47	150	N/A	7.0	3.4	7.2
3	Nederland, TX	02/23/99	AICl/Epi 20:1 45 ppm	3/250	5/30	15/0	11	47	150	N/A	7.0	3.7	5.3
4	Nederland, TX	02/23/99	AICl/DAD 20:1 40 ppm	3/250	5/30	15/0	11	47	150	N/A	7.0	5.8	5.5
5	Nederland, TX	02/23/99	CV1777 34 ppm	3/250	5/30	15/0	11	47	150	N/A	7.0	0.9	7.1
6	Hot Springs, AR	03/31/99	ACH/Epi 20:1 5 ppm	1/85	15/8	30/0	20	2	None Visible	N/A	7.2	1.9	7.2
7	Hot Springs, AR	03/31/99	ACH/DAD 20:1 5 ppm	1/85	15/8	30/0	20	2	None Visible	N/A	7.2	2.2	7.2
8	Hot Springs, AR	03/31/99	AICl/Epi 20:1 11 ppm	1/85	15/8	30/0	20	2	None Visible	N/A	7.2	2.6	6.8
9	Hot Springs, AR	03/31/99	AICl/DAD 20:1 11 ppm	1/85	15/8	30/0	20	2	None Visible	N/A	7.2	2.8	6.8
10	Hot Springs, AR	03/31/99	CV1787 6 ppm	1/85	15/8	30/0	20	2	None Visible	N/A	7.2	0.7	7.3

1. Best Results of dosage curve.
2. Dosages are on a mass basis. Products are 40 to 50 percent active. For dosages on an active basis, conversions must be made.
3. DADMAC is 20% active with a viscosity of 20 cps which correlates to a molecular weight of 250,000.
4. Epi-DMA is 50% active with a viscosity of 150 cps which correlates to a molecular weight of 300,000.
5. ACH is 50 percent active. AICl₃ is 50% active.



FIGURE 11

Test Results - Comparison Testing

TEST	LOCATION	DATE	CHEM/ PPM "2"	JAR TEST MIXING (MINUTES/RPM)		RAW WATER SPECIFICATIONS			FINAL SETTLED RESULTS ¹			
				3/50 1/100	1.5/4 0 5/20	10/0	PPM	NTU	HACH	TOC	UV254	PH
1	Marshall, TX	02/18/99	ACH/Epi 20:1 35 ppm	3/50 1/100	1.5/4 0 5/20	10/0	18	11	130	0.40	6.0	6.2
2	Marshall, TX	02/18/99	ACH/DAD 20:1 30 ppm	3/50 1/100	1.5/4 0 5/20	10/0	18	11	130	0.40	6.0	5.9
3	Marshall, TX	02/18/99	AIC/Epi 20:1 35 ppm	3/50 1/100	1.5/4 0 15/20	10/0	18	11	130	0.4	6.0	4.5
4	Marshall, TX	02/18/99	AIC/DAD 20:1 35 ppm	3/50 1/100	1.5/4 0 15/20	10/0	18	11	130	0.4	6.0	4.3
5	Marshall, TX	02/18/99	CV1703 19 ppm	3/50 1/100	1.5/4 0 15/20	10/0	18	11	130	0.4	6.0	6.1
6	Longview, TX	03/30/99	ACH/Epi 20:1 8 ppm	.6/80	15/30 20/20	10/0	21	2	101	N/A	6.8	6.9
7	Longview, TX	03/30/99	ACH/DAD 20:1 8 ppm	.6/80	15/30 20/20	10/0	21	2	101	N/A	6.8	6.9
8	Longview, TX	03/30/99	AIC/Epi 20:1 12 ppm	.6/80	15/30 20/20	10/0	21	2	101	N/A	6.8	5.9
9	Longview, TX	03/30/99	AIC/DAD 20:1 12 ppm	.6/80	15/30 20/20	10/0	21	2	101	N/A	6.8	5.9
10	Longview, TX	03/30/99	CV1725 8 ppm	.6/80	15/30 20/20	10/0	21	2	101	N/A	6.8	7.0

1. Best Results of dosage curve.
2. Dosages are on a mass basis. Products are 40 to 50 percent active. For dosages on an active basis, conversions must be made.
3. DADMAC is 20% active with a viscosity of 20 cps which correlates to a molecular weight of 200,000.
4. Epi-DMA is 50% active with a viscosity of 150 cps which correlates to a molecular weight of 300,000.